# The Scientific Review,

AND

# SCIENTIFIC AND LITERARY REVIEW,

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## SUBJECT MATTER INDEX OF APPLICATIONS FOR PATENTS.

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Weighing, &c.—J. Nadal, O. Gerike.

Wheels for Carriages, &c.—H. Longsdon (com.), E. L. Taylor.

Winding, &c.—J. Bernhardt, J. H. Johnson, (com.).

Window Blinds and Sashes.—J. Walker, F. Altock, E. Edwards (com.), E. V. Harris. A. M. Clarke (com.).

Wire, Wire Working, &c.—E. Fox.

Wood.—A. Martin, J. Allen.

Zinc, &c.—W. R. Lake (com.)

⁂ *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

## QUEBRACHO WOOD.

Mons. F. Rhem has lately communicated a paper on the "Quebracho Wood" to the *Société Industrielle du Rouen*, from which the following particulars have been translated by our contemporary the *Journal of the Society of Arts*:—This wood belongs to the family of the Asclépiades, and comes from America. Being very hard, and composed of a great quantity of interlaced fibres, the tannin it contains is different from that of chestnut or of oak. Gelatine precipitates this tannin out of a water solution with a flesh colour, while salts of protoxide of iron give an ash-gray precipitate, and the peroxide salts a dirty greenish colouration. When boiled with weak sulphuric acid, the tannin is not converted into gallic acid. According to a German chemist, quebracho wood contains 18 per cent. of tannic acid. The back of this wood contains an alkaloid analogous to quinine. Extract of quebracho, now much used in wool dyeing, giving a yellow shade with a tin solution. It gives even shades, resembling those of cutch, is used with bichromate of potash, but its principal use is for obtaining blacks, for which the wool is given first a bottom of the extract, then passed through iron, and dyed with the quebracho; this, in these conditions, can replace cutch. Solutions of quebracho wood, or extract, will only keep limpid if heated to a certain temperature, but get turbid on cooling. Dyeing experiments, with the dry quebracho extract, as manufactured by a French firm, in comparison with cutch, have proved the former of more value, since, with a lower price, it possesses a greater richness of colouring matter. Three series of trials were made; one, by passing the cotton prepared in a quebracho or cachou bath through bichromate of potash; the second, through iron; and, in the third, the patterns were passed through iron and then chromed. In all cases the same results were obtained, showing the advantage of the quebracho over cutch, in spite of a slightly more greyish shade of the colours obtained with the former. The same results have been got by printing mordants on calico, ageing, dunging, and dyeing with quebracho extract or cutch; in all cases the quebracho shades being identical with those of cutch, not only for the tone of colour, but also in regard to fastness.

**Nitrate of Silver for Worms.**—Dr. M. P. Greensword (*Medical Summary*) was accidentally led to regard nitrate of silver as a remedy for worms. Further use of this drug has convinced him that it is one of the most potent agents we have for the destruction and expulsion of worms. He gives a teaspoonful three times a day, of a solution of five grains of nitrate silver in six ounces of rain water.

**The Growth of New York City.**—As shown in the statistics of the Department of Buildings, the growth of New York was more rapid last year than in any twelvemonth since 1872, when the speculative building mania reached its height. That year the expenditure on buildings was not less than 27,000,000 dol. In 1877 it was less than half as much. It increased to sixteen and a half millions in 1878. The figures for 1880 show an expenditure of 24,000,000 for new buildings.

## Reviews.

### GAS AND WATER COMPANIES' DIRECTORY.

"The Gas and Water Companies' Directory, 1881." Edited by Charles W. Hastings, Editor and publisher of "The Review of Gas and Water Engineering," "Gas Works Statistics," &c., 22, Buckingham Street, Adelphi, London, W.C. This work is under the patronage of all the leading Gas and Water Engineers and Secretaries of the Metropolitan and Provincial Companies throughout the United Kingdom. Fifth Issue. London. Printed by John Smith and Co., Long Acre. 1880.

This is a useful work on a subject of general interest. We need say no more.

**British Patents.**—For many months past we have *month by month* supplied our readers with a classified list of applications for British Patents. It would scarcely be available to classify at shorter periods. However, our contemporary, the *Engineer*, has for years past published abstracts of specifications of patents which have been filed, and recently deemed it desirable to increase the utility by printing them periodically in a collected form, with careful indexes of names and subjects, thus:—The names of inventors and nature of the whole of the inventions protected during each three months may be ascertained by reference to one volume, or for every year by reference to four volumes only, instead of, perhaps, over forty, besides, for recent inventions, the tedious reference to a manuscript list. The official abridgments are only brought down to within several years of date, and are not even then illustrated, so that the *Illustrated Record* offers great facilities not given by an official publication. The volume, moreover, contains what is nowhere else published, namely, a complete record of all the important patent cases which have been tried in the preceding three months, and also a variety of interesting matter—statistical and otherwise—relating to patents for inventions. The volume is thus one which must be of the greatest value to all large manufacturers of patented articles, to patent agents, and for reference in all technical libraries. We consider that with our monthly list and this *Illustrated Record*, the inventor will be well equipped.

⁂ Other reviews are postponed.

## IN MEMORIAM.

When dreaming in the early dawn,
  Thy absent spirit hover'd near
The eastern sky, whose golden lawn
  Harbours the souls we mourn for here!

A vision claim'd my heart sleep bound:
  A slender form, whose clear eyes shine,
'Neath happy brows with sapphire crown'd,
  Her linen robes white, pure, divine.

And she has bid our realms farewell,
  And far from us she walks on high;
Where joy, no human tongue can tell,
  From life eternal wafts each sigh.

Calm seraphs in her Father's home,
  Waited her advent, and behold!
At His behest bright angels come,
  And harp around her harps of gold.

So, in the sweet Christ's promise sure,
  Her soul's in peace, her night is day!
And God, whose mercy shall endure,
  Wipeth her tears of earth away.

V. Gonville.

Mr. Joseph H. Clyde, of Atantic, Iowa, has patented an improvement in *pantaloons*, the object being to prevent the protrusion in front and wrinkling in rear in the knee portions of the legs of pantaloons, and also the uneven wearing of the seat portion.

## THE ACTUAL LATERAL PRESSURE OF EARTHWORK.

By B. Baker, M.Inst.C.E.

In a paper recently read at the Institution of Civil Engineers, the author dealt with the actual lateral pressure of earthwork as distinguished from the "text-book" pressures which, as Professer Barlow pointed out half-a-century ago, were based upon theoretical calculations that disregarded the most vital elements existent in fact. The question affected the stability of retaining walls, the strength of tunnel linings, the timbering of shafts, headings, tunnels, deep trenches for sewers, and many other works of every-day practice. Attention was directed to the measurements by Lieut, Hope, R.E., of the direct thrust of sand on a pressure-board, which was found to be equivalent to that of a fluid weighing 19lbs. per cubic foot, and to the experimental brick retaining walls tested by the same officer, when pressures of half that intensity were recorded, and these actual pressures were compared with the corresponding theoretical pressures, of 27lbs. and 23 lbs. per cubic foot. General Pasley's and General Cunninghame's model revetment walls were then referred to, and General Burgoyne's experimental masonry walls, 20 feet in height. Colonel Michon's 40-feet wall, averaging hardly more than 1-12th of its height in thickness, and Mr. Constable's "toy" retaining walls of wooden blocks with pease for earthwork, indicated no less than the previously cited experiments that the actual measured lateral pressure of good filling hardly ever exceeded one-half of the "text-book" pressure corresponding to the given slope of repose.

The author's experiments on the direct lateral pressure of ballast and large stones were next summarised, the results being in general considerably lower than those obtained by Lieutenant Hope. His experience on the 34 miles of deep timbered trenches and other works of the underground railway, also furnished many examples of the actual pressure on timber wallings, tunnel headings, retaining walls and vaults. Exceptionally light works standing perfectly, and apparently very heavy works which had failed, alike served to prove that the designing of retaining walls was in most instances more a matter for judgment and experience than for calculation. Thus one of the walls on the Metropolitan Railway, which should have failed with a fluid pressure of 19 lbs. per cubic foot, had stood perfectly, whilst another wall capable of resisting 107 lbs. had occasioned much trouble. During the construction of the line, the wall on the west side of the Farringdon Street Station failed bodily, by slipping out at the toe and falling backwards on to the slope of the earthwork. This wall was 29 feet 3 inches high above the footings and 8 feet 6 inches thick, and the soil consisted of 17 feet of made ground, 3 feet of loamy gravel, and 9 feet of clay. On the opposite side of the station the ground was retained by vaults, 29 feet high by 17 feet deep, but these also slid forward and came over at the top, the movement continuing even after the work had been doubled in thickness. The softening and lubricating action of water on clay was the proximate cause of these failures, as otherwise the latter vaults would have resisted a fluid pressure of 92 lbs. per cubic foot.

The failures of dock walls, though numerous and instructive, afforded no direct evidence as to the actual lateral pressure of earthwork, because in nearly every instance the failure was traceable to defective foundations. Reference was made to the original Southampton Docks wall constructed forty years ago, having a height of 38 feet from foundation to coping, and a thickness at the base of 32 per cent. of the height between the buttresses, and of 45 per cent. at the buttresses. If founded on a rock bottom a fluid pressure of 40 lbs. per cubic foot would have been required to overturn the wall; but before the backing had been carried to the full height, the wall moved forward in places as much as 3 feet. In the recent extension of the same docks the wall had an effective thickness of 45 per cent. at the base, and a fluid resistance of from 60 to 70 lbs. The Whitehaven Dock wall, 38 feet high and 13 feet 9 inches thick, stood perfectly, whilst the Avonmouth Dock wall of the same height and 16 feet thick failed. A somewhat similar case of sliding forward occurred at the New South Dock of the West India Docks, London, where the wall was 35 feet 9 inches high, and 13 feet (or 36 per cent. of the height) thick at the base. The fact that the stability of a dock wall depended far more upon the foundation than upon the thickness was well illustrated by the quay wall at Carlingford, which had a height of 47 feet 6 inches and a thickness of only 15 feet at the base. In contrast with this slight structure was cited the Marseilles Dock wall, having a thickness of 16 feet 9 inches for a height of 32 feet. One of the boldest examples of a lightly proportioned wharf wall was that built by Colonel Michon at Toul. With a height of 26 feet and a batter of 1 in 20, the thickness of the wall through the counterforts was only 3 feet 7 inches at the base, and though the filling was ordinary material, and the floors rose within 6 feet of the top of the coping, no movement had occurred. Reference was made to the failures of dock walls at Belfast Harbour and in the original portion of the Victoria Docks, and the proportions adopted in more recent works were cited. An early example of a successful wall on a very bad foundation was afforded by Sir John Rennie's Sheerness wall. The subsoil consisted of loose running silt for a depth of about 50 feet, covered with soft alluvial mud, and the depth at low water was 30 feet. A piled platform was prepared, and upon this the wall, no less than 50 feet in extreme height and 32 feet in effective thickness at the base, was built. Another exceptionally heavy but more modern dock wall was that of the Chatham Dockyard Extension, the extreme height of which was 43 feet and the thickness at the base 21 feet, or, say, 50 per cent. of the height.

Walls made of large concrete blocks resting upon a mound of rubble had been constructed in many of the Mediterranean ports, generally with success but occasionally with failure, as at Smyrna, where, owing to the great settlement, six and seven tiers of blocks had to be superimposed instead of four, and the quay wall had after all to be supported by a slope of rock in front. The proportions arrived at by experience were a width of 9 metres at the top, and a thickness of not less than 2 metres for the rubble mound, a depth of 7 metres below water, and a thickness of 4 metres for the concrete block wall resting on the mound, and a minimum thickness of 2·5 metres, and a height of 2·4 metres for the masonry wall coping the concrete blocks. Examples were not wanting of walls founded on rubble mounds where the thickness held a smaller ratio to the height than the 42 per cent. considered necessary by French engineers. The lightest of all, perhaps, was the dry masonry outer wall of the St. Katharine's breakwater, Jersey, which was only 14 feet wide at the base, for a total height of 50 feet. The most cursory examination of the cases of failure alluded to would serve to justify the statement, that the numerous failures of dock walls did not afford any direct evidence as to the actual lateral thrust of earthwork. Thus, remembering that General Burgoyne's battering wall, only 17 per cent. of the height in thickness, supported perfectly the heavy sodden filling at its back, no calculation was required to show that the 32 and 45 per cent. Southampton Dock counterforted wall, the 42 per cent. Avonmouth Dock wall, the 36 per cent. West India Dock wall, the 50 per cent. Belfast Harbour wall, and the 30 per cent. Victoria Dock wall, would all have stood perfectly had the foundation been rock, as in the instance of General Burgoyne's experimental walls, instead of mud, clay and silt, as was actually the case.

The aim of the author in the present paper had been to set forth, as briefly as possible, what he knew regarding the actual lateral thrust of different kinds of soil, in the hope that other engineers would do the same, and that the information asked for by Professor Barlow more than half a century ago might be at last obtained. Although the acquirement of the missing data would probably lead to no modification in the general proportions of retaining structures, since these were based upon dearly-bought experience, and not upon theoretical treatises, it was none the less desirable that it should be obtained, for an engineer should be able to show why he believed a given wall would stand or fall. To assume upon theoretical grounds a lateral thrust, which experiments proved to be excessive, and to compensate for this by giving no factor of safety to the wall, was not a scientific mode of procedure.

As a result of his own experience, the author made the thickness of retaining walls in ground of an average character equal to one-third of the height from the top of the footings, and if any material was taken out to form a panel, three-fourths of it was put back in the form of a pier. The object of the panel, as of the 1½ inch to the foot batter which he gave to the wall, was not to save material, for this involved loss of weight and grip on the ground, but to effect a better distribution of pressure on the foundation. It might be mentioned that the whole of the walls on the Metropolitan District Railway were designed on this basis, and that there had not been a single instance of settlement, or of falling over or sliding forward.

## ON M. C. FAURE'S SECONDARY BATTERY.

THE researches of M. Gaston Planté on the polarisation of voltameters led to his invention of the secondary cell, composed of two strips of lead immersed in acidulated water. These cells accumulate and, so to speak, store up the electricity passed into them from some outside generator. When the two electrodes are connected with any source of electricity the surfaces of the two strips of lead undergo certain modifications. Thus, the positive pole retains oxygen and becomes covered with a thin coating of peroxide of lead, while the negative pole becomes reduced to a clean metallic state.

Now, if the secondary cell is separated from the primary one, we have a veritable voltaic battery, for the symmetry of the poles is upset, and one is ready to give up oxygen and the other eager to receive it. When the poles are connected, an intense electric current is obtained, but it is of short duration. Such a cell, having half a square metre of surface, can store up enough electricity to keep a platinum wire 1 millim. in diameter and 8 centims. long, red-hot for ten minutes. M. Planté has succeeded in increasing the duration of the current by alternately charging and discharging the cell, so as alternately to form layers of reduced metal and peroxide of lead on the surface of the strip. It was seen that this cell would afford an excellent means for the conveyance of electricity from place to place, the great drawback, however, being that the storing capacity was not sufficient as compared with the weight and size of the cell. This difficulty has now been overcome by M. Faure: the cell as he has improved it is made in the following manner:—

The two strips of lead are separately covered with minium or some other insoluble oxide of lead, then covered with an envelope of felt, firmly attached by rivets of lead. These two electrodes are then placed near each other in water acidulated with sulphuric acid, as in the Plante cell. The cell is then attached to a battery so as to allow a current of electricity to pass through it, and the minium is thereby reduced to metallic spongy lead on the negative pole, and oxidised to peroxide of lead on the positive pole; when the cell is discharged the reduced lead becomes oxidised, and the peroxide of lead is reduced until the cell becomes inert.

The improvement consists, as will be seen, in substituting for strips of lead masses of spongy lead; for, in the Plante cell, the action is restricted to the surface, while in Faure's modification the action is almost unlimited. A battery composed of Faure's cells, and weighing 150 lbs., is capable of storing up a quantity of electricity equivalent to one horse-power during one hour, and calculations based on facts in thermal chemistry show that this weight could be greatly decreased. A battery of 24 cells, each weighing 14 lbs., will keep a strip of platinum ⅝ of an inch wide, 1-32nd of an inch thick, and 9 ft. 10 ins. long, red-hot for a long time.

The loss resulting from the charging and discharging of this battery is not great: for example, if a certain quantity of energy is expended in charging the cells, 30 per cent. of that energy can be reproduced by the electricity resulting from the discharge of the cells; moreover, the battery can be carried from one place to another without injury. A battery was lately charged in Paris, then taken to Brussels, where it was used the next day without recharging. The cost is also said to be very low. A quantity of electricity equal to one horse power during an hour can be produced, stored, and delivered at any distance within 3 miles of the works for 1½d. Therefore these batteries may become useful in producing the electric light in private houses. A 1250 horse-power engine, working dynamo-machines giving a continuous current, will in one hour produce 1000 horse-power of effective electricity, that is to say 80 per cent of the initial force. The cost of the machines, establishment, and construction will not be more than £40,000 and the quantity of coal burnt will be 2 lbs. per hour per effective horse-power, which will cost (say) ½d. The apparatus necessary to store up the force of 1000 horses for twenty-four hours will cost £48,000 and will weigh 1500 tons. This price and these weights may become much less after a time. The expense for wages and repairs will be less than ¼d. per hour per horse-power, which would be £24 a day, or £8,800 a year; thus the total cost of one-horse power for an hour stored up at the works is ¾d. Allowing that the carriage will cost as much as the production and storing, we have what is stated above, viz., that the total cost within 3 miles of the works is 1½d. per horse-power per hour. This quantity of electricity will produce a light, according to the amount of division, equivalent to from 5 to 30 gas burners, which is much cheaper than gas,

INSTANTANEOUS SILVERING MIXTURE.—To coat copper or brass objects with silver, without difficulty or loss of time, the following process is given in the *Gewerb.-Bl. f. Ost- u. Westprussen:* Mix 3 parts of chloride of silver with 20 parts of powdered cream of tartar and 15 parts of powdered common salt. Moisten a suitable quantity of the mixture with water, and rub it with a piece of blotting paper upon the metallic object, which must be thoroughly clean. The latter is afterward rubbed with a piece of cotton upon which precipitated chalk is dusted, then washed with water, and polished with a dry cloth.

## ON INJURIES SUSTAINED BY FIRE-BOXES.

By Mr. Daniel Reed.

The following paper was read before the Inventors' Institute by Mr. T. Morgan on May 12, 1881:—

The object of this paper is to illustrate an invention that has been designed chiefly to avert a system of injuries sustained by fire-boxes of locomotive and other engines resulting from the use of unsuitable water or heavy work on heavy gradient railways, and I do not think the thing could be better explained than by first illustrating the action that causes the injuries referred to. This I will endeavour to do as briefly as possible.

The injuries sustained by the fire-boxes and boiler tubes of locomotive engines is a question that seriously affects the locomotive departments of most railways, and yet it is one that has not had the attention its importance deserves.

This, I think, must be owing to the action which causes the injuries not being fully understood, and they having, in a great measure, been looked upon as the effects of ordinary wear and tear that cannot be helped.

In reference to the injuries, these consist chiefly of fractures in various parts of fire-boxes, but mostly in the flanges of the tube plates and back plates, also in the breaking of waterspace stays and tube partitions in tube plates.

Fractures frequently take place in other parts of fire-boxes, but those I have referred to will be sufficient to illustrate the action I wish to explain as the cause.

These fractures often occur in the fire-boxes of comparatively new engines, which proves that it is not ordinary wear and tear that is the cause.

The action is simply an excessive expansion, which takes place in fire-boxes when engines are working heavily under certain conditions of water in the boiler, and a subsequent sudden contraction, which takes place as the blast is shut off. The parts referred to are thus bent out towards the corners, and back to their normal position; and when it is stated that this action takes place continually, especially when hard water is used, and attains the greater effect by the greater hardness attained by the water in the boiler, it will be easily understood how the mischief is effected.

While these expansion strains are being sustained towards the corners of the fire-box the same action is taking effect in the upper parts, upwards. It is then that the water-space stays and tube partitions are strained and eventually break.

I will now refer to the cause of this expansion action. It arises from the effects of the intense heat of a locomotive furnace when the engine is worked up to maximum capacity, such as against a storm or up a heavy gradient, especially towards the end of a heavy day's work, when the water in the boiler has attained a high degree of hardness. Under these conditions the water round the fire-box boils into froth, and then, as a natural consequence, expansion in all parts of the fire-box takes place, and it only varies with the intensity of the furnace heat and the condition attained by the water.

The fire-box ends of tubes also invariably leak, more or less, when an engine has been worked under these circumstances, which proves that they also suffer from the same cause. The tube holes towards the sides of the tube plate also becomes more or less oval in shape, owing to the plate expanding towards the corners.

The fractures and other injuries resulting from these strains have mostly been attributed to the effects of over-pressure or bad workmanship and inferior material, but the real cause is this expansion.

The reason, I believe, that engineers have not long since discovered this expansion action in the fire-boxes of locomotives, from heavy work and the use of hard water, is owing to their being misled by stationary and marine boilers not being affected in the same way, forgetting the much greater intensity of furnace heat required by locomotives than is required by either of the other class.

Locomotives are worked up to a much higher strain in pressure and power for their size than any other class of engines, hence the reason the furnace heat necessary is so intense and the fire-boxes are so easily injured.

A fire-box frequently suffers more in a few minutes towards the end of a journey by the strains imposed upon it under the circumstances I have described than it would by months of fair wear.

The effective condition of engines that are over strained in this manner is often seriously impaired by the unavoidable leaky state the fireboxes attain to, not to speak of the very heavy consumption of fuel that is entailed.

It will be remembered that one object of discussion at the convention of American engineers, which took place at Philadelphia in the years 1876 and 1877, was locomotive fire-boxes, especially in reference to a system of fractures which took place in steel fire-boxes, a class of fire-box which, it appears, is now largely in use there. The most serious of the fractures, it was stated, occurred about the centre of the side plates and passed in a vertical direction through the stay holes, commencing from 6 inches to 12 inches above the fire-grate, and extending about 20 inches upwards. In one part of the report they are described as mysterious ruptures, as they occur without any apparent cause, also that the fractures are not confined to any one kind of steel, or even to steel itself, as it was found that the plates of iron boxes had an equal tendency to fracture besides being liable to blister.

Several theories were suggested as the cause, but the real cause could not be ascertained.

I will endeavour to describe what I think the fractures resulted from. They must have resulted, I believe, from the same expansive action I have explained in reference to copper fire-boxes, owing, however, to the different nature of the metals the action takes effect in a different way; that is to say, it is the subsequent contraction in the case of steel and iron plates with iron water-space stays, that is the immediate cause, as will perhaps be understood from the following:—

The expansion takes place at the parts under reference in precisely the same way it does in copper plates, that is, from the centre vertical line of the plates towards the corners of the fire-box, only it is not so extensive; but the injurious effect is made up for by the unyielding nature of steel and iron water-space stays, as compared with copper stays, during the process of contraction.

The stays, while contraction is taking place, get cooled and become rigid, while still in their bent position, by the water condensing from its frothy state, a process that takes place the instant the furnace blast is shut off, while at the same time the expansion is kept up on the plates by their being still in immediate contact with the fire. It is then that the stays have time to be sufficiently cooled to become rigid before the contraction of the plates is brought to bear upon them. There is thus always a tensile strain upon the centre vertical line of fire-box plates when iron water-space stays are used, as engines cool down after each day's work, and which varies in degree with the hardness of the water used and the strain the engine had been worked up to towards the end of its day's work.

It is also stated in the report "that fractures occur under various and all circumstances, except while boilers are under steam, with fire on the grate. It some cases they occur when the boiler is washing out and others when filling with cold water, sometimes when standing empty, at others when cooling down and nearly cold, sometimes after standing a day or two, or while stay bolts are being caulked or other work producing a jar or vibration of the plate, and a few had been known to take place just after a fire had been started in lighting up."

It will be observed that contraction would be under greatest strain at all the parts where fractures took place under all the circumstances enumerated, even in the case of those last mentioned, although at first it would appear otherwise.

These instances must have occurred just as the fire was being put in when the strain by contraction was at its highest pitch, and requiring only a slight jar, such as would be caused in lighting up, or perhaps a slight heat, while not sufficient to give ease by expansion.

Those that gave way from the jar caused by caulking may be compared to the breaking of an over-tight steel tyre by the jar of high speed or skidding by the application of a brake.

It is well known to locomotive engineers that when the blast of a locomotive is at full play upon the furnace that the hot gases rise in great volume from it, that they form into columns on entering the tubes, and pass through with the rapidity of a gun shot. In doing so, it will be plain to any thoughtful mind that a very small percentage only of their heat can be absorbed by the tubes.

From this it will be easily understood that the power of absorbing heat will be much more effectual in the case of the vertical tube system under reference, even apart from the great increase of direct heating surface it will give. When a locomotive furnace heat is being worked up to high intensity, the fire-box gets so intensely hot as to be incapable of absorbing more than a small percentage of the heat. There is, then, no other course for it but to fly to waste through the tubes and up the chimney.

Not less important than the prevention of the injuries from the expansion action in fire-boxes will be first the economy in the consumption of fuel that will be effected; and second, the practicability adapting boilers of much lighter weight than are usually employed.

The latter will admit of the construction of lighter works on new railways, while being easier on existing ones.

The system will be especially suitable for cold countries where great radiation of heat takes place, or in any country where unsuitable water is used.

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A Telephone Reissue.—The Patent Office, after careful hearing, has granted to Mr. Berliner, a reissue of his original telephone patent, of January 15, 1878, with several new claims, among which is one that virtually awards to the above author the priority of invention and use of the local battery in conjunction with telephone instruments. Prior to the invention of Mr. Berliner it was necessary to yell very loud in order to make anybody hear at any considerable distance through the telephone, and even then the speaker's voice was heard quite faintly. But now, with this improvement added, the telephone is rendered so sensitive that conversation in whispers may be readily carried on, and the ordinary tones of conversation are delivered by the instrument in the most perfect and admirable manner. Mr. Berliner is entitled to the highest honour for his remarkable invention, which is now used in all parts of the world, The patent is held by the National Bell Telephone Company, of Boston, Mass.

# The Scientific Review

AND

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*President*, SIR ANTONIO BRADY.

SESSION 1880—1881.

Members' Meeting at 8 p.m. on Thursday, June 9th; this may be postponed by special notice.

Subscriptions are payable to Mr. G. A. Stretton, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. Campin, Sec.

## Proceedings of the Institute.

The Annual General Meeting took place on 26th May. The usual elections took place; but the full report is reserved for our next issue.

THE PATENT LAW REFORM COMMITTEE have approved the following Public Bill. We commend it to the attention of our readers.

## ENGLAND'S GREATEST FOLLY

is the Repression of the Progress of Arts and Manufactures, which are advanced by New Inventions, for they tend to prevent

## DEPRESSION OF TRADE.

Antagonism to Invention is the direct effect of maintaining in their present state our costly and inefficient Patent Laws, as is evident from the fact that the

## AMERICANS ARE FOREMOST

in Industrial Progress, as in the United States less than *Ten pounds* take up a Patent for an Invention for 17 years; whilst in this country *One Hundred and Seventy-five pounds* have to be paid for a 14 years' Patent, open to all kinds of legal quibbles.

With the intention of doing much to reform all this, a Bill for Amending the Patent Laws is now before the House of Commons.

## PETITION! PETITION! PETITION!

in its favour, which anyone can do by signing the Petition to Parliament, at the Scientific Review Office, 21, Cockspur Street, or at Mr. Campin's Office, 46, Southampton Buildings, Chancery Lane, after 9th June.

## Monthly Notices.

*The International Electrical Exhibition at Paris* will clearly be a success so far as exhibits are concerned, for there are no fewer than 800 applicants for space in France alone. In the section devoted to Great Britain there are 64 exhibitors, so that we shall be well represented without Government patronage and assistance. The council of King's College and the managers of the Royal Institution have agreed to lend apparatus for the historical collection of instruments formerly belonging to Oersted, Ampère, Faraday, Wheatstone, and the early students of electricity, which will form an interesting feature of the exhibition. Sir W. Thomson will send his apparatus, and it is probable that the building will be surmounted by a light-tower worked on the method he has recently suggested for use in lighthouses, &c.

*The Death of Dr. Bernard Davis*, the distinguished craniologist, is announced. A resident of Hanley, it is not too much to say that he was better known throughout the scientific world than in his own district. Dr. Davis was an M.D., F.R.S., and F.S.A., and a member of many of the learned and scientific societies of Italy, France, Russia, Sweden, Denmark, Germany, and other countries. He was joint-author with Thurnam of "Crania Britannica," and was one of the greatest authors on craniology in Europe. His collection of skulls, said to be the largest in this or any other country, was recently purchased by the Royal College of Surgeons. Dr. Davis was a frequent correspondent of eminent scientific men in various countries, and his loss will be felt over a circle of European extent. The deceased was in his 81st year.

*The Centenary of Sir David Brewster's Birth* is to be celebrated in Edinburgh by a public dinner, on the 9th of December next.

*Mitigation of Pain* by administering a recurrent series of sound-waves, by means of a tuning-fork and a sound-board, to the affected part, has been obtained by M. Vigouroux, a French surgeon. M. Bondet has devised an improved arrangement. A tuning-fork is kept in constant vibration by means of an electro-magnet, and the undulations are communicated to the skin by means of a rod. Neuralgia is said to be removed in a few minutes, and anæsthetic effects are induced by a longer action.

*A Simple Filter Pump.*—In the *Scientific American* John Eitel describes a simple device for accelerating the operation of filtering. It is intended to replace the Bunsen filter pump in many instances, and it consists of a collapsible rubber bulb mounted between two standards and capable of being compressed by a thumbscrew. The mouth of the rubber bulb is connected with the filtering bottle by means of a flexible tube provided with a pinch cock. The filtering funnel is provided with a small platinum cone which prevents the filtering paper from being drawn downward with such force as to rupture it. The exhaustion is effected by first expelling the air by turning the thumbscrew, the flexible tube is then connected and the screw retracted, to produce a partial vacuum. To render the operation continuous, the stopcock is closed when it becomes necessary to again expel the air from the bulb.

*The Eddystone Lighthouse.*—The last coping-stone of the new Eddystone Lighthouse was unexpectedly laid June 1st by the Duke of Edinburgh. His Royal Highness, who is on an official visit of inspection of the Coastguard stations, left Falmouth in the morning in the *Lively*, accompanied by the Duchess, Lady Harriet Grimston, Lady-in-Wating, and Mr. Rickard, R.N., his private secretary. At the Eddystone they were received by Mr. Douglas, chief engineer. The royal party and Commander Le Strange landed on the rock and went through the old lighthouse, and expressed themselves as being pleased with the order and arrangements observed in the tower. Thence they repaired to the new lighthouse, which has now been built to its intended height. Just as the Royal party arrived, the workmen were about to place the last stone to the cornice of the tower. This operation was immediately stopped in order that the Duke might perform the ceremony himself. After distributing the cement, his Royal Highness placed the stone in position, and, amid cheers, declared it to be well and truly laid. The Duke, as Master of the Trinity Board, laid the foundation-stone on the 19th of August, 1879.

THE SCIENTIFIC REVIEW
AND
Scientific and Literary Review
INCORPORATING THE "JOURNAL OF THE INVENTORS' INSTITUTE."

JUNE, 1881.

## EDUCATION FOR THE PERIOD.

To those persons who have not given attention to practical politics, it may seem strange, but nevertheless it is a notion generally acquiesced in, and not inexplicable, that the Members of Parliament representing the various boroughs of our great metropolis of London are not uncommonly men of comparatively little value as public men or politicians.

Taking into account what has just been stated, it will not appear extraordinary that one of these representatives of the metropolis (though the elect of a portion, Southwark, which is perhaps of as industrial a character as any) publicly avows his preference for that antiquated system of education which bases all higher mental culture on the accurate knowledge of the Greek and Latin languages.

However, as the gentlemen referred to is not a nobody, for he is Ex-Professor James E. Thorold Rogers, we deem it worth while in the interest of advantageous national education, to protest against such an injurious theory getting well received, which it readily may; for since so many of our upper classes have scarcely any other educational equipment than a certain amount of knowledge of the dead languages, they will readily accept this utterance for gospel; and in consequence we shall soon find the bright intellects of our elementary schools seeking to get forward in classic and literary studies, instead of endeavouring to progress in mathematical, physical, and practical knowledge, which is really what in this country we want to encourage. We have plenty of classical scholars, and surely from mere humanity no one would seek to increase the number of mere classicists who have not a penny in the purse; for we may apply in temporal sense the Apostle's phrase, and designate them of all men most miserable; but we have not enough real men of Science and technologists. In order that our readers may understand what are Mr. Thorold Rogers' views on this question, we quote the following from a communication inserted in the *Times*, 27th May, 1881, in which, referring to Christ Church, Oxford, he says:—

Every University man knows that the principal work of a public school is the Latin and Greek languages. This is the material which a public school boy generally takes to an Oxford College, and this material the tutors or censors have to improve. That the richest college in Oxford, which takes three students a year from Westminster—the head master of which has raised the school from the condition in which it was left by the two former head masters to one of great efficiency—and more students by open election should develope only 18 and six firsts in ten years is a result which requires explanation. In most Oxford colleges, too, about one-half the number of firsts gained under moderators are further gained under public examiners. At Balliol and New the proportion is about three-fifths; but at Christ Church during the last ten years it has been only one-third. This means that the material which Christ Church gets from Westminster School and by open competition steadily deteriorates under the hands of the censors, and the censors do not explain the fact by pointing to the achievements gained in subjects which are learned in Oxford itself, and not in any notable degree at schools nor from the censors. Out of the six firsts, two, at least, were gained by Westminster boys.

I don't know what my political opinions have to do with what long experience and an unwearied activity on behalf of every movement in favour of the higher education induce me to conclude. But I have long believed, and still believe, that sound Latin and Greek scholarship is the necessary basis of higher education; that mathematics by itself may leave the student a dunce; *that there is no educational value whatever in all the physical sciences taken together, if only taken;* [these italics are ours, and the last three words appear to us occult] and that the schools of modern history, law, and theology are shams, intended to satisfy a craving for undeserved distinction.

As it may probably afford our readers a key to the understanding of these views of Mr. Thorold Rogers, we may here state as showing that he is a man utterly out of accord with our workers, though he may be a great card with the money-bag men or capitalists, that as regards the Patent Laws, James Thorold Rogers wrote to that well known enemy of Inventors, Mr. Macfie, to say that although "no one, I presume, wishes to say that an inventor is undeserving, and should go unrewarded," yet he considered the existence of Patent Laws prejudicial to the community, adding, "that if a law can confer a right on one person only by inflicting a wrong upon a number of other persons, it is intrinsically vicious and cannot be defended on the ground of its intentional goodness," a broad and sweeping thesis that must at once stigmatize a very large proportion of property rights as "vicious," that is if the academic pedant is to put dogmatical assumptions in the place of practical verity.

# Proceedings of Societies.

## ROYAL SOCIETY.

May 12.—General Strachey, V.P., in the chair.—G. A. Daubrée, J. C. Marignac, Carl Nägeli, and Carl Weierstrass were elected Foreign members.—The following papers were read: "On the Physiological Action of β Lutidine," by Messrs. C. G. Williams and W. H. Waters,—"Discussion of the Results of some Experiments with Whirled Anemometers," by Prof. Stokes,—"Investigations in the Spectrum of Magnesium," by Profs. Liveing and Dewar,—and "Note on the Reduction of the Observations of the Spectra of One Hundred Sun Spots observed at Kensington, by Mr. J. N. Lockyer.

## ASTRONOMICAL SOCIETY.

May 13.—J. R. Hind, President in the chair.—Messrs. J. A. Barringer, T. P. Gray, and R. Wigglesworth were elected Fellows.—Father Perry described the preparations made by M. André, director of the observatory at Lyons, for observing the transit of Venus. He has been making experiments upon the ligament observed on an artificial model of the transit set up in the subterranean part of the Ecole Normale.—Mr. Lockyer gave an address to the Society on his observations of the thickened iron lines seen in the spectra of sun spots. He has confined his attention to noting the behaviour of twelve of the iron lines in the most easily visible part of the sun-spot spectrum, between F and D, and finds that the lines which are seen reversed and thickened in the spectrum of one spot do not correspond with the group of lines seen reversed in the spectrum of another spot. The relative intensity of the individual lines also varies from spot to spot, and the lines which are seen thickened in the sun-spot spectrum do not correspond with the bright iron lines seen in the spectrum of the prominences. From his observations Mr. Lockyer draws the deduction that the iron vapour is broken up into simpler constituents in the lower and hotter regions of the sun's atmosphere.—Mr. Gill, the director of the Cape Observatory, was called upon by the President to give some account of the work upon which he is engaged. He proposes to undertake a redetermination of the constant of aberration. Hitherto he has been occupied with the observation and reduction of occultations, and with observations for the determination of the parallax of stars with the heliometer which he made use of for his observations of the opposition of Mars.—Mr. Glaisher read a paper, by Mr. Burnham and Prof. Hough, of Chicago, on their observations of the nebula near Merope.—Mr. Ranyard mentioned that he had received a letter from Dr. H. Draper, of New York, stating that he had obtained another photograph of the nebula of Orion showing stars down to the 14·7 magnitude. The magnitude of these stars has been specially measured by Prof. Pickering, so that there can be little doubt that in the photograph, which was exposed for 104 minutes, stars were registered which were only just on the limit of visibility with an 11-inch telescope similar to that with which the photograph was taken. The nebula as shown in the photograph extends over an area fifteen minutes in diameter.—The following papers were also presented to the Society and taken as read: by Prof. R. S. Ball, "On a simple Approximate Method of calculating the Effect of Refraction upon the Distance and Position Angle of two Adjacent Stars,"—T. W. Backhouse, "On the Inclination of the Zodiacal Light,"—Prof. A. S. Herschel, "Fall of a Meteorite on March 14th, 1881,"—Mr. W. F. Denning, "Transit Times of the Spots on Jupiter,"—Sir G. B. Airy, "Addition to a Paper on the Effect on the Moon's Movement in Latitude produced by the Slow Change of Position of the Plane of the Ecliptic,"—Mr. E. Hartwig, "Note on the Physical Libration of the Moon,—Mr. W. H. M. Christie, "Note on the Flexure of the Greenwich Transit Circle," and "Further Remarks on Mr. Stone's Alterations of Bessel's Refractions,"—Mr. A. M. W. Downing, "On the Supposed Difference in the Refractions north and south of the Zenith of Melbourne,"—Prof. A. Hall, "Observations of the Companion of Sirius made at the U.S. Naval Observatory, Washington,"—Mr. E. J. Stone, "Note on the Effect of Atmospheric Dispersion on the Determination of Solar Parallax by Meridian Observations of Mars," also "Note on some Points connected with the Determination of the Co-efficient of the Parallactic Inequality,"—and Mr. A. Marth, "Ephemeris for Physical Observations of Jupiter, 1881-82."

## GEOLOGICAL SOCIETY.

May 11.—R. Etheridge, Esq., President, in the chair.—Messrs. J. Deeley, G. Kilgour, and R. W. MacLeod were elected Fellows.—The following communications were read: "Notes on the Fish-remains of the Bonebed at Aust, near Bristol, with the Description of some new Genera and Species," and "On some Fish-spines from the Coal-Measures," by Mr. J. W. Davis,—"On some Specimens of Diastopora and Stomatopora from the Wenlock Limestone," by Mr. F. D. Longe,—"On a new Species of Plesiosaurus (*P. Conybeari*) from the Lower Lias of Charmouth, with Observations on *P. megacephalus*, Stutchbury, and *P. brachycephalus*, Owen," by Prof. W. J. Sollas, accompanied by a Supplement on the Geological Distribution of the Genus Plesiosaurus, by Mr. G. F. Whidborne,—and "On certain Quartzite and Sandstone Fossiliferous Pebbles in the Drift in Warwickshire, and their Identity with the true Lower-Silurian Pebbles with similar Fossils in the Trias at Budleigh Salterton, Devonshire," by the Rev. P. B. Brodie.

## STATISTICAL SOCIETY.

May 17.—J. Caird, Esq., President, in the chair.—Mr. R. D. Urlin, Barrister-at-Law, read a paper "On the Incumbered Estates Commission, Ireland, 1849-58, with Suggestions for a similar Jurisdiction in England.

## MICROSCOPICAL SOCIETY.

May 11.—Prof. P. M. Duncan, President, in the chair—Ten new Fellows were elected and nominated.—Amongst the objects exhibited were Seibert's polarising microscope, Nachet's binocular dissecting microscope, Vérick's skin microscope, Houston's botanical microscope, embryological sections from the Naples zoological station, &c.—Papers and notes were read:—"On a New and Remarkable Annelid," by Mr. Stewart,—"On the Markings of Diatoms," by Dr. Matthews, Mr. J. Deby, and Count Castracane,—"On a New Species of Hydrosera, Willich," by Dr. Stolterfoth,—and "On Improvements in Illumination," by Mr. J. Smith.—Also a note by Prof. Abbe on the conditions of micro-stereoscopic vision with special reference to the fact that the *lineal* amplification of an object in depth is equal to the square of the lineal amplification in breadth, reduced, however, in proportion to the refractive index of the medium in which the object is; thus an object under a power of 100 times would be magnified 10,000 times (lineal) in depth if in air, 7,500 times, if in water, and 6,600 if in oil or balsam.

## MATHEMATICAL SOCIETY.

May 12.—S. Roberts, Esq., President, in the chair.—Prof. C. Niven was admitted into the Society, and the following were elected Members:—Messrs. L. Rosenthal, F. Franklin, C. A. Von Velzer, and Miss C. Ladd.—The following papers were communicated:—"On Ptolemy's Theorem," by Mr. C. W. Merrifield,—"The Summation of certain Hypergeometric Series," by the Rev. T. R. Terry,—"Quaternion Proof of Mr. S. Roberts's Theorem of Four Cointersecting Spheres," by Mr. J. J. Walker,—"Some Solutions of the '15 Girl' Problem," by Mr. Carpmael,—and "Note on the Co-ordinates of a Tangent Line to the Curve of Intersection of Two Quadrics," by Mr. W. R. W. Roberts.—Shorter communications were made by the President, Prof. Cayley, Mr. Hart, and Mr. J. J. Walker.

## PHYSICAL SOCIETY.

May 14.—Prof. Fuller in the chair.—Messrs. D. J. Blakely and W. Kilner were elected Members.—Prof. Foster communicated a paper, by Prof. Rowland and Mr. E. H. Nichols, "On Electric Absorption in Crystals": these experiments showed that calcite had no absorptive power,—Prof. Minchin described his new sine absolute electrometer,—and a paper was read from Dr. J. E. Mills, "On the Ascent of Hollow Glass Bulbs through Liquids."

## FOLK-LORE SOCIETY.

May 13.—Earl Beauchamp, President, in the chair.—Mr. H. B, Wheatley read two papers. The first was "On the Substitutions of Pepys and his Times," Mr. Wheatley said that the value of noting the superstitions of Pepys consisted in the fact that Pepys was far from being a superstitious man, and that, therefore, the credulities he gave way to belonged to the age rather than to the man. Mr. Wheatley pointed out some of the amusing parts of the diary on dreams, apparitions, vows, fortune-telling, and the like.—Lord Beauchamp in the discussion which followed observed that Archbishop Laud believed in the omens to be derived from dreams.—The second paper was "A Note on English Fairies." Its object was to throw some light upon the influence which literature had exercised upon popular traditions. Thus down to Chaucer's time the notion of fairies was mixed up with the old Greek and Latin mythology, Pluto, for instance, being styled by Chaucer the king of the fairies, The divines seemed to relegate the whole of the fairy world to the regions of the devil world. What was not of God was necessarily of the devil. But Shakespeare introduced something altogether different, more pure, and more true. His fairies were the fairies of the people. He simply transferred to his pages for all time what he had heard himself and had believed in himself down in his Warwickshire home. From his time, therefore, the literary knowledge of English fairies has been nearer the true popular tradition, though again Madame d'Aulnois has introduced the Dame Durden kind of fairy into the realms of literature.—The President, in commenting upon the interest and value of Mr. Wheatley's paper, pointed out how the names of places and fields had been influenced by fairy-lore, and gave some instances from Madresfield, Worcestershire.

## INSTITUTION OF CIVIL ENGINEERS.

April 26. Mr. Abernethy, President, in the chair.—The paper read was "On the Relative Value of Tidal and Upland Waters in maintaining Rivers, Estuaries, and Harbours," by Mr. W. R. Browne.

## PHOTOGRAPHIC SOCIETY.

April 12.—J. Glaisher, Esq., President, in the chair.—The following papers were read: "Notes of a Swiss Tour with Gelatine Plates," by Mr. W. D. Howard.—"On Art and Photography: Suggestions for bringing them into closer Connexion," by Mr. H. B. Berkeley,—and, "On some Remarks on the Natural Camera, and on Uncorrected Lenses in Photography," by Capt. Abney. The natural camera described is one where instead of optical glasses being used a pin-hole suffices to depict objects.

## QUEKETT MICROSCOPICAL SOCIETY.

April 22.—T. C. White, Esq., President, in the chair.—Four new Members were elected.—Mr. J. W. Groves exhibited and described a new form of freezing microtome, in which the action of ether spray had been successfully substituted for that of ice and salt.—Mr. A. D. Michael described a typical specimen of the genus Platygaster, which he exhibited in the room.—Some further discussion on the so called borings of Cliona took place between Mr. J. G. Waller and Mr. C. Stewart.—A paper was read by the President "On the Histology of the Gustatory Organs of the Rabbit's Tongue," the subject being illustrated by coloured diagrams and specimens exhibited under the microscope.—Some curious instances of malformation in young fry of the trout, hatched under abnormal conditions during a voyage, were exhibited by Mr. Parsons.

## ANTHROPOLOGICAL INSTITUTE.

April 12.—F. W. Rudler, Esq., V.P., in the chair,—The election of Lieut.-Col. R. G. Woodthorpe and Mr. T. V. Holmes was announced.—Mr. J. Lucas read a paper "On the Ethnological Relations of the Gipsies." In tracing back the past history of the races described under the common name of Gipsies, we pass through two periods—the first historical, dating from A.D. 1414; the second partly historical, partly inferential. This older section formed the subject of Mr. Lucas's paper.—The author premised that linguistic evidence shows that the various tribes of Gipsies now scattered over Europe can be referred to several Eastern tribes from India to Persia. The investigation dates back to archæological times, especially in relation to the working of metals, and the presence of a large number of pure Sanskrit words in the language of European Gipsies, many of which do not occur in Hindustani. The "Archæological" section embraces all that was not included under the several sections. "The Gipsies in Egypt," "Gipsies among the Romans," or "The Dark Ages"; but a good deal of the evidence upon which the archæological conclusions rest runs through those several sections as well as through sections specially devoted to the names Zingaro and Rom. It will thus appear that the term "Gipsy" is used by the author in the widest sense, as meaning "an Asiatic tribe which has wandered into Europe," though strictly it should mean only those who came by way of Egypt.

## FOLK-LORE SOCIETY.

April 22.—Mr. Hyde Clarke in the chair.—The Chairman read a paper "On the Relation of English Folk-lore to the English Tongue, and on the Influence of Each on the Other." Pointing out that the nursery rhymes and popular sayings of England generally began with what our fathers called head-rhymes, Mr. Clarke proceeded to show the evidence which this gave of the antiquity of popular sayings, and how the poetry of literature had always been influenced by the genius of the language for head-rhymes even after end-rhymes had come into vogue. In the discussion which followed the paper Messrs. A. Nutt, Pfoundes, Fitzgerald, and Gomme took part.

## ARISTOTELIAN SOCIETY.

April 25.—S. H. Hodgson, Esq., President, in the chair.—A paper was read conveying the views of Prof. Harris, the eminent Hegelian and well-known editor of the St. Louis *Journal of Speculative Philosophy*, on the position and significance of Hegel in the history of philosophy.

May 9.—S. H. Hodgson, Esq., President, in the chair.—Rev. E. P. Scrymgour was elected a Member.—Mr. W. S. Casson read a read "On the English School (Hartley, J. Mill, and J. S. Mill)," which was followed by a discussion.

## SOCIETY OF ANTIQUARIES.

April 23.—This being St. George's Day, the Society met together at the hour of 2 p. m. for the purpose of electing a President, Council, and Officers for the ensuing year.—The Earl of Carnarvon, President, delivered the anniversary address, in which he passed under review the most important events of the previous year, and the prospects of the Society in the immediate future. He dwelt at some length on what he called the most pressing archæological question of the day, the pre-historic monuments of this country, and announced that the Council had decided on commencing the publication of a series of scale plans and drawings of these monuments, which had been prepared and presented by the Rev. W. C. Lukis. He also announced that the Council was about to publish in "Vetusta Monumenta" two plates in chromo-lithography, full size, of the two sides or covers of the magnificent Evangeliarium exhibited last year by the Earl of Ashburnham. After noticing the excavations at the Brading villa and at Beth—to the expenses of each of which a grant had been made by the Counbil—Lord Carnarvon animadverted on the remissness shown by some of the local secretaries (whose appointments lapsed on that day) in sending reports to the Society and in discharging generally the duties which they undertook on accepting office. There were, no doubt, brilliant exceptions, which it would be invidious to specify, but on the whole he feared the institution of local secretaries had not hitherto yielded the results which the Society had a right to expect.—The following gentlemen were elected to fill the offices of President, Council, and Officers of the Society; The Earl of Carnarvon, President; H. Reeve, E. Freshfield, and A. W. Franks, Vice-Presidents; Dr. C. S. Perceval, Treasurer; H. S. Milman, Director; W. C. Borlase, E. W. Brabrook, G. T. Clark, J. Clarke, J. Evans, G. W. G. Leveson Gower, P. C, Hardwick, H. C. M. Lyte, C. T. Martin, J. T. Micklethwaite, F. Ouvry, G. Scharf, Rev. W. Stubbs, Rev. B. Webb, Lieut-Col. G. H. Weston, Council; and C. K. Watson, Secretary.

May 12.—The Earl of Carnarvon, President, in the chair.—Mr. C. R. Markham exhibited a silver tazza, probably intended for a dish for sweetmeats. The hall mark was of the year 1532. In the bowl was thirty-seven circular depressions, in the centre one of which are the arms of Chichester impaling Palmer. Round the inside of the rim are the words, "Benedictus Deus in donis suis et sanctis in omnibus." The dish, which is evidently for domestic use, was presented to Arlington Church, co. Devon, by John Palmer Chichester, grandson of the Giles Chichester whose arms are on the dish. It is now used in that church as an alms dish.—The Rev. C. J. Cheales communicated a paper on some mural paintings in Friskney Church, Lincolnshire, of which he at the same time exhibited three tracings, representing respectively the Last Supper, the Assumption of the Blessed Virgin, and the Nativity.—Mr. J. P. Harrison exhibited a piece of slate with scratchings on it and other remains from Towyn, Merionethshire. Mr. Harrison had persuaded himself that the scratchings in question were representations of urns, celts, hatchets, baskets, tunics, and other articles.

## ROYAL SOCIETY OF LITERATURE.

April 20.—C. Clark, Esq., in the chair.—Mr. R. N. Cust read an interesting paper "On Spain, its Cities and Customs." Mr. Cust called attention to the architectural "restorations" now or recently in progress, which in the case of the Al-Hamra he considered to be excessive; on the other hand, in the great Mosque-Cathedral of Cordova, and in the Jewish Synagogue, at Toledo, the work had been judiciously done.

## BRITISH ARCHÆOLOGICAL ASSOCIATION.

April 20.—Mr. C. Brent in the chair.—The Rev. Dr. Hooppell reported the discovery of a Saxon incised slab at St. Andrew's Church, Auckland, and of a carving of an infant.—Mr. C. Lyman described the remarkable series of interments now being uncovered at Stapenhill, Burton-on-Trent. More than twenty interments have been met with, lying in various directions, of both sexes, some of the bones indicating men of tall stature. The discovery is attracting considerable attention in the locality, but the period of the burials had not been decided. The sketches of one or two urns which have been found were shown and were pronounced to be of Saxon date, but it is probable that some of the burials are of an earlier period, since flint implements have been found. The others date probably from pagan Saxon times. The site is the summit of high ground commanding a capital view.—Mr. L. Brock called attention to the work which has now been carried on for many years by the Duke of Wellington at Silchester, and detailed the nature of some of the recent excavations there. A room has recently been uncovered, the paved floor of which rests on a series of flue tiles for heating, laid close together under the whole surface.—Mr. W. Myers exhibited a large collection of bronze implements of prehistoric and Roman date, acquired by him in Austria. They exhibit several interesting departures from well-known types.—Mr. C. Sherborne described a series of playing cards of fifteenth century date, and exhibited facsimiies.—The first paper was by Mr. M. Thompson, and was descriptive of two remarkable manuscripts of the fourteenth century, hitherto unedited. They form portions of apocryphal gospels, and render the legend of the Holy Rood, the history of Judas, the story of Simon Magus, the conversion of Tiberias, and the like.—The second paper was by Mr. H. S. Cuming, and was read in his absence by Mr. W. de Gray Birch, and was descriptive of two seals of early date of the Knights Templars. The author referred to the fact that the order was in existence long after the usual date stated for its suppression, and indeed quite on to recent years.

## NUMISMATIC SOCIETY.

April 21.—J. Evans, Esq., President, in the chair,—Mr. S. Powell was elected a Member.—Mr. W. Myers exhibited eight tetradrachms of Alexander the Great and two of Alexander Ægus, lately acquired by him in Egypt: also a Gaulish silver coin.—Mr. Krumbholz exhibited a pattern of a five franc piece, 1848, by Farochon, and another of the same date by Alard; pattern proofs in gold and silver of a two-keepang piece of the East India Company struck for Bencoolen, and a proof in Silver of an East India Company's rupee of 1784.—Mr. Sheriff Mackenzie communicated a paper "On an unpublished Penny of Alexander II. of Scotland," struck at Forres, reading on the reverse WALTER ONFRES, similar coins of this type having hitherto being classed to Alexander III.—The Hon. J. J. Gibbs communicated a paper "On the Bahmani Coins of the Deccan," in which he described several hitherto unknown coins of the kings of this dynasty both in gold and silver.

## CHEMICAL SOCIETY.

April 21.—Dr. Debus in the chair.—It was announced that a ballot for the election of Fellows would take place at the next meeting, May 5th.—The following papers were read: "On the Distillation of Mixtures of Carbon Disulphide and Carbon Tetrachloride," by Mr. F. D. Brown.—"On the Estimation of Hydric Peroxide by means of Potassic Permanganate," by Mr. W. E. Adeney.—"On the Oxidation of Sulphurous Acid," by Mr. H. P. Dixon. The author finds that when sulphur dioxide, steam, and oxygen are exposed to a temperature of 100° C. no diminution of volume takes place, and therefore no sulphuric acid is formed. If the temperature be allowed to fall, so that water condenses, a slight contraction in volume is observed.—"On the Reduction of Cinnamic Alcohol," by Messrs. F. Hatton and W. R. Hodgkinson. When this substance is heated to 100° C. for three or four days with sodium amalgam (containing fifteen per cent. of sodium and a small quantity of water), cinnamene and methylic alcohol are produced.

## METEOROLOGICAL SOCIETY.

April 20.—Mr. C. Greaves, V.P., in the chair.—Mr. W. H. Goss and Admiral T. L. Massie were elected Fellows.—The following papers were read: "On the Frequency and Duration of Rain," by Dr. W. Koppen.—and "Results of Experiments made at the Kew Observatory with Bogen's and George's Barometer's" and "On a Discussion of Mr. Eaton's Table of the Barometic Height at London with regard to Periodicity," by Mr. G. M. Whipple.

## A NEW DISCOVERY IN PHOTOGRAPHY.

At the last meeting of the Photographic Society of Great Britain, Mr. L. Warnerke described the discovery he has recently patented. The discovery he said consisted in the fact that a gelatine plate submitted to pyrogallic acid became insoluble in those parts acted upon by light, exactly in the same way as gelatine was acted upon by chromic salts, the insolubility being in proportion to the amount of light and the thickness of the gelatine. This property he proposed to utilise in various ways. The drawback in the ordinary gelatine process was that unless the exposure were very accurately timed there was considerable danger of over-exposure, and, as intensification was very difficult, pictures by the gelatine process were often inferior to those by collodion. By the new process he was, however, able not only to intensify, but also to overcome the drawbacks arising from over-exposure. The latter he effected by using the emulsion on paper. He had found that no matter how much the paper was over-exposed the picture—provided the developer was restrained sufficiently—was not injured, while in the case of the emulsion on glass there was not only halation of the image, but a reversal also. The transfer of the image from paper on to the glass was a very easy matter. The paper was immersed in water and placed in contact with a glass plate. The superfluous moisture was removed by a squeegee, and the paper could then be stripped off, leaving the tissue on the glass. Hot water was then applied, which dissolved all the gelatine not acted on by light, together with the free bromide or soluble salts, and the image was left upon the glass in relief. Intensification he effected by mixing with the emulsion a colouring non-actinic matter, which was not affected by silver. Aniline colours he had found answered the purpose, and in that way special emulsion for special purposes could be prepared. That method of preparation he thought would be especially suitable for magic-lantern slides. He claimed for his discovery that by it relief could be obtained far more easily than by the ordinary bichromatised gelatine, and therefore it was especially suitable for the Woodburytype process. By mixing emery-powder with the emulsion it was rendered fit for engraving purposes, and by a combination with vitrified colours the image could be burnt in and so was adapted for enamels. In the ordinary methods of producing enamels from carbonised gelatine the latter, from the difficulty of burning it without the formation of bubbles, was a great source of trouble. By using a suitable emulsion, however, so little gelatine might be employed that this drawback was overcome. The process could also be adapted for collotype printing. In the course of his remarks, Mr. Warnerke demonstrated the removal of a gelatine picture produced by his method from paper on to glass, and showed that the mere immersion and washing in hot water fixed the picture by the dissolving of the gelatine unacted upon by light, which thus carried away the free bromide of silver. In conclusion, he stated that the sensitive paper could be used in the camera in lengths wound on rollers, and exhibited a camera which he had made for the purpose.

Captain Abney, after some remarks in reference to halation and reversal of the image, remarked that in the production of enamels by Mr. Warnerke's process there was some danger of the silver producing the well-known yellow colour which spoilt so many vitrified photographs. The discovery made by Mr. Warnerke was a most important one, and, in regard to Woodburytype, really opened up quite a new era. Mr. W. S. Bird endorsed Captain Abney's remarks as to the value of the process. To be able to produce gelatine negatives without the fear of the yellow stain was a great boon, and the only point was whether photographers would take the trouble and risk in the necessary transfers. As to its adaptability to Woodburytype, there could not be the slightest doubt. The great difficulty was to obtain the necessary relief, and he knew of a company which had recently gone to a great expense to fit up the necessary machinery, when Mr. Warnerke was able to give them what they wanted at a merely nominal cost.

Mr. T. Sebastian Davis also referred to the importance of the dissovery, and suggested that by the use of the emulsion on paper a landscape might be photographed in which the clouds and the foreground might be rendered with equal truth, instead, as was too often the case, of the sky being over-exposed. Mr. T. Bolas inquired if Mr. Warnerke had tried adding bichromate of potash to his emulsion. The addition of promide of silver in the case of a carbon print was supposed to increase its sensitiveness, but whether it did so he could not say. Mr. Warnerke, in the course of his reply, said he had not found the yellow colour, spoken of by Captain Abney, in the enamels which he had made. It was possible to eliminate all the silver by the use of ferric salts. With regard to Mr. Davis's suggestion, he was afraid he must throw cold water upon it, for he did not think it cold be realised unless he used a developer for the clouds different from that used for the foreground. He had not tried bichromate of potash as mentioned by Mr. Bolas.

## A BLEACH FOR THE PERIOD.

When Thenard succeeded in adding another equivalent of oxygen to water, converting $H_2O$ into $H_2O_2$, he had made one of the most brilliant of modern discoveries. Sixty-three years have passed since that event, yet oxygenated water, peroxide of hydrogen, hydrogen dioxide, as the compound has been successively called, is still regarded as one of the most remarkable products of chemistry. Resembling water in its freedom from colour and odour, and mingling with it in all proportions, it is distinguished from that liquid by its sirupy consistency and by its higher specific gravity (1·452). When pure it begins to undergo decomposition at 70° Fah., giving off bubbles of oxygen and being converted into water. This change is quickened by the addition of an alkali, and retarded by that of an acid. When dissolved in water it is much more stable, and its aqueous solutions are prepared and sold for medicinal and photographic purposes.

For the preparation of hydrogen dioxide, baryta is still found indispensable, and a clearer conception of the process and its probable cost will be gained if we remember what is the source and what are the properties of baryta. This substance occurs as the sulphate, called heavy spar, in various parts of the United States, notably at Hopewell, New Jersey, on the line of the Bound Brook Railroad, about 30 miles from Philadelphia. When pulverised, mingled with powdered charcoal, and strongly heated, the sulphate of barium becomes a sulphide, and if this be treated with hydro-chloric acid and water added, we have a solution of barium chloride. By decanting this and adding a solution of an alkaline carbonate, barium carbonate is precipitated, and if we collect the precipitate and calcine it in a crucible, the oxide of barium—baryta—$BaO$, results. Now this oxide, when placed in a tube, heated to dull redness, and subjected to a current of atmospheric air, takes up another portion of oxygen, becoming that interesting substance, barium dioxide or peroxide of barium, $BaO_2$, which, as some of our readers will recall, was brought into use by Tessie du Motay for bleaching silk, feathers, &c., and which is rapidly growing in practical importance.

Powdered barium dioxide, made into a paste with water and put by portions at a time into cold and dilute hydrochloric acid, dissolves without disengagement of gas, yielding barium chloride and hydrogen dioxide. The changes may be thus expressed:—

$$\overset{\text{Barium dioxide.}}{BaO_2} + \overset{\text{Hydrochloric acid.}}{2HCl.} = \overset{\text{Barium chloride.}}{BaCl_2} + \overset{\text{Hydrogen dioxide.}}{H_2O_2}$$

The barium chloride and hydrogen dioxide both remain in solution, and to separate the barium it is precipitated in the form of the sulphate by the careful addition of dilute sulphuric acid, agreeably to the following equation:—

$$\overset{\text{Barium chloride.}}{BaCl_2} + \overset{\text{Sulphuric acid.}}{H_2SO_4} = \overset{\text{Barium sulphate.}}{BaSO_4} + \overset{\text{Hydrochloric acid.}}{2HCl.}$$

The hydrochloric acid thus reproduced now admits of more barium dioxide being added, and the operation may be many times repeated if the vessels are kept cool. If the hydrogen dioxide be required pure and concentrated, the remaining barium chloride is precipitated by sulphate of silver, the solution poured off, and evaporated *in vacuo*. The concentrated hydrogen dioxide is not demanded for industrial purposes. Solutions containing 3·04 per cent. by weight suffice for the English market. They are called ten-volume solutions, because 1 cubic inch evolves 10 cubic inches of oxygen when fully decomposed. Twenty-volume and thirty-volume solutions are made in England to order.

It is said that when the Empress Eugenie, who was a blondi, led the fashion, certain dark-haired belles of Paris, anxious to emulate her even in the colour of her hair, had theirs bleached to the "golden" tint, by a hairdresser of that city, who employed for the purpose hydrogen dioxide. In London it is used for a like object on dark false hair, which is saturated with a ten-volume solution and then exposed for two or three days, when the oxygen is liberated and the lighter shades are obtained. Hydrogen dioxide effectually bleaches blood serum in one of the processes for obtaining colourless blood albumen. It is also used for cleaning and bleaching oil paintings and engravings, and for bleaching oil, wax, and ivory, especially the last. Of this, the inferior qualities used in Sheffield for knife handles are put first into a solution of sodic carbonate to remove the grease and open the pores; then washed and immersed in a solution of crude hydrogen dioxide containing about 2·9 per cent., to which one-eighth part of strong aqua ammoniæ had been added. This is kept in a warm place for two or three days, when the handles are removed and slowly dried in the air. The deep colour is thus removed, and a beautiful pearly-white ivory, when polished, is the result.

The action of hydrogen dioxide in bleaching is to destroy the colour directly by oxidising it, and this, without the introduction of any foreign body into the vat, an action altogether different from that of the principal bleaching agents, sulphurous acid and chlorine. The former does not destroy the colouring matter, it merely combines with it to form a colourless compound which is prone to undergo decomposition and therefore to return to the original colour. Chlorine acts only in the presence of water, from which it takes the hydrogen to form hydrochloric acid, leaving the oxygen thus liberated to do the bleaching.

That hydrogen dioxide, either under a true or false name, is employed in the bleaching processes of print works, and that its cost alone prevents its general introduction, there is no doubt. Anticipating its extended use, and recognising its unrivalled advantages, the *Société Industrielle de Rouen* offers a prize open to competition until the 1st of October, for a process of manufacturing a hydrogen dioxide which shall possess the power to decolorise indigo equal to that of chlorine, and which shall not cost more than ten times as much as that bleach. Left to itself, the perfecting of such an invention may linger for a generation. The prize offered is a gold medal, and the prize winner retains the exclusive right to his invention. This may be all that the Rouen Society can afford to offer, but in view of the great and general benefits to be anticipated from such an invention, the prize should be made international, and societies in Belgium, Austria, Germany, England, and America ought to co-operate with their French sister, and so swell the amount that experts in all nations shall feel the stimulus.—*Textile Record.*

## QUALITATIVE ANALYSIS OF ALKALOIDS.

As well known, reagents for certain alkaloids and their salts have hitherto been wanting. Mr. Maurice Robin proposes, in a new French scientific journal, *Revue Scientifique*, a new method of qualitative analysis of these substances based on the use of sulphuric acid and cane sugar. A small portion of the alkaloid to be examined is mixed with double its weight of common powdered sugar in a small porcelain capsule, one or two drops of sulphuric acid are added, and the mixture is stirred with a glass rod. Hydrochlorate of morphine treated in this manner gives a very beautiful rose colour, which passes very rapidly to violet. The latter colour is persistent, and resembles that which is obtained on dissolving permanganate of potash. Sulphate of quinine gives a colour which is at first greenish, then bright yellow, and finally coffee brown, surrounded by a yellow circle. Sulphate of atropine gives a violet colour, which increases in depth till it becomes at length brown. With narcotine there is developed a persistent and very characteristic mahogany colour which cannot be mistaken. With salicine, a bright red; with veratrine, a dark green. With codeine the reaction is especially manifest, and this is the more interesting from the fact that up to the present time we have had no precise reagent for this alkaloid. The colour obtained is a magnificent and very intense cherry red, which soon changes and becomes violet. This violet tint, which is very beautiful, differs somewhat from that which morphine assumes; and, moreover, these two alkaloids are distinguished very readily by the first reaction, which, in the case of morphine, is accompanied by a rose colour. This reaction may also serve to show whether, as sometimes happens, codeine has been adulterated with sugar. If adulteration is present the cherry red and violet will make their appearance, while pure codeine acted upon by sulphuric acid shows no change of colour whatever.

## PAPER PULP FROM WOOD.

To make wood pulp the wood, four feet in length, and of any thickness, is brought in at the basement of the manufactory, placed in the barking jack (one stick at a time), where two men with drawn knives rapidly peel off the bark. It is then conveyed by an elevator to the first floor, sawed in two-foot lengths with crosscut saws, and passed on to the rip-saw, where it is slabbed (this is, a small portion of wood on opposite sides taken off), to permit it resting firmly in the grinding engine. It is then passed to the boring machine (an upright 1½ inch auger, with foot attachment, driven by power), where the knots are bored out. The wood is then placed in racks of the same size as the receptacle in the grinding engine, and carried out to be ground. The grinding engines are upright, and receive at a filling one twentieth of a cord of wood. The wood is placed in a receptacle, and by a simple, variable, automatic feed process, is pressed flatwise between two outward revolving rolls, composed of solid emery, which are flooded with a spray of water, carrying off the fibrilized pulp in a stream through revolving screens to the tank or stuff-chest in the basement. It is then pumped up into a vat that forms part of the wet machine. In this vat is constantly revolving a large cylinder faced with fine brass wire-cloth, which picks up the particles of pulp out of the water and places them on the felt (an endless piece of woollen goods which makes between rolls, for different purposes, a continual circuit of the wet machine). On the cylinder is turned a heavy roll, called the "couch;" between the two, when they meet, the cylinder leaves the pulp, with most of the water pressed from it. The pulp now makes its appearance on the felt above the concha roll in a beautiful sheet 38 inches in width, and is carried along in a steady flow a distance of about 8 feet, where it passes between (the water here again being pressed from it) but not beyond two heavy rollers, the upper one iron, the lower one wood; it adheres to the upper roll, which is constantly turning, wrapping it up, and when a sufficient thickness is attained, is cut off by a knife being pressed to the roll, which is attached to the machine for that purpose. It now leaves the roll in a thick white sheet, 36×38 inches, which is received by a boy in attendance on a table conveniently attached to the machine, and folded into a sheet 14×26 inches. It is then placed on scales until the weight is 100 pounds, when it is placed in a press and firmly tied into square, compact bundles. It is now ready for shipment to the paper mill.

## BRITISH ASSOCIATION.

The following arrangements have been made for the fifty-first meeting of the British Association, to be held at York:—The first general meeting will be held on Wednesday, August 31, at 8 p.m. precisely, when A. C. Ramsay, F.R.S., V.P.G.S., will resign the chair, and Sir John Lubbock, Bart., M.P., F.R.S., President-Elect, will assume the presidency, and deliver an address. On Thursday evening, September 1, at 8 p.m., a *soirée;* on Friday evening, September 2, at 8 30 p.m., a discourse by Professor T. H. Huxley, LL.D., Sec. R.S.; on Monday evening, September 5, at 8.30 p.m., a discourse by W. Spottiswoode, D.C.L., LL.D., President of the Royal Society; on Tuesday evening, September 6, at 8 p.m., a *soirée*; on Wednesday, September 7, the conluding general meeting will be held at 2.30 p.m. No report, paper, or abstract can be inserted in the Report of the Association unless it is given in before the conclusion of the meeting. Excursions to places of interest in the neighbourhood of York will be made on the afternoon of Saturday, September 3, and on Thursday, September 8.

The general officers are—General Secretaries: Capt. Douglas Galton, C.B., D.C.L., F.R.S.; Philip Lutley Sclater, Ph.D., F.R.S. Acting Secretary: George Griffith, M.A., F.C.S., Harrow; General Treasurer: Prof. A. W. Williamson, F.R.S. Local Secretaries: Rev. Thomas Adams, M.A.; Tempest Anderson, M.D., B.Sc., York. Local Treasurer: W. W. Wilberforce, York.

The sections are arranged as follows:—

A. *Mathematical and Physical Science.*—President: Prof. Sir William Thomson, F.R.S. Secretaries: Prof. W. E. Ayrton; Oliver J. Lodge, D.Sc.; and Donald McAlister, B.A., B Sc. (Recorder).

B. *Chemical Science.*—President: Prof. A. W. Williamson, For. Sec. R.S., V.P.C.S. Secretaries: Harold B. Dixon, M.A., and P. Phillips-Bedson, D.Sc. (Recorder).

C. *Geology.*—President: Andrew Crombie Ramsay, LL.D., F.R.S. Secretaries: W. Topley, F.G.S. (Recorder) and W. Whitaker, F.G.S.

D. *Biology.*—President: Richard Owen, C.B., F.R.S. Secretaries: G. W. Bloxam, M.A., F.L.S.; W. L. Distant; W. A. Forbes, F.Z.S.; Prof. M'Nab, M.A.; John Priestley; and Howard Saunders, F.L.S., F.Z.S. *Department of Zoology and Botany.*—Richard Owen, C.B., F.R.S. (President) will preside. Secretaries: Professor M'Nab, M.D. (Recorder), and Howard Saunders, F.L.S. F.Z.S. *Department of Anthropology.*—Professor W. H. Flower, F.R.S. (Vice-President), will preside. Secretaries: G. W. Bloxam, M.A., F.L.S. (Recorder), and W. L. Distant. *Department of Anatomy and Physiology.*—Professor J. S. Burdon Sanderson, F.R.S. (Vice-President) will preside. Secretaries: John Priestley (Recorder), and W. A. Forbes, F.Z.S.

E. *Geography.*—President: Sir J. D. Hooker, K.C.S.I., C.B., F.R.S. Secretaries: H. W. Bates, Assist.-Sec. R.G.S., F.L.S., and E. C. Rye, Librarian F.G.S., F.Z.S. (Recorder).

F. *Economic Science and Statistics.*—President: The Right Hon. M. E. Grant Duff, M.P., F.R.S. Secretaries: Constantine Molloy (Recorder), and J. F. Moss.

G. *Mechanical Science.*—President: Sir W. G. Armstrong, C.B., F.R.S. Secretaries: A. T. Atchison, M.A. (Recorder), and H. Truman Wood, M.A.

Tickets for the meeting may be obtained of the Local Secretaries at York, and at the office of the Association, 22, Albemarle-street, London, W.; or on application by letter, from August 17 to August 24, to the General Treasurer, Professor A. W. Williamson, British Association, University College, London, W.C.

## RECENT AMERICAN AND FOREIGN INVENTIONS.

*Concentration in Vacuum Pans*, where very dense or thick extracts are required—such, for instance, as in the case of dyewood extracts—it is found that, owing to the low temperature that exists in the vacuum, it is impossible to remove sufficient of this moisture to secure the required concentration. Hence it is usual to destroy the vacuum at intervals by opening the valves and admitting air, and then allowing the mass to heat up to the temperature allowed by atmospheric pressure, after which the exhaustion is again effected, which insures an increased disengagement of the moisture from the mass, now heated much beyond the vacuum temperature, so that a more dense concentration is thus effected. As this system, however, requires repeated and alternate stages of heating and exhausting, its action is slow, and the repeated abrupt renewals of the vacuum are manifestly wasteful of power. Mr. Jacob G. Reed, of New York city, has patented certain means whereby the vacuum or partial vacuum in the pan may be kept constant, or nearly so, while at the same time an influx of hot dry air is discharged in regulated jets up through the mass of fluid, so that the moisture is absorbed or evaporated from all parts of the mass, and the mass kept at the same time in constant motion during the influx and exhaustion, insuring uniform liquidity and the reduction of the mass to the desired density in a constant, rapid, and economical manner.

*Improved Ore-washing Apparatus* has been patented by Mr. James H. Totman, of Plattsburg, N. Y. The object of this invention is to provide a simple and effective device for keeping the journal bearings in ore-jigs and other machines free from dust, sand, and other substances that otherwise get in them and cut the journals and bearings. It consists of a double ring or annular box closed at the bottom and open at the top of the annular space between its sides, and having a lateral opening from said space for the introduction of water therein, it being designed to set said water box about a journal or journal bearing, and to force a constant stream of water through the lateral opening, so that said water shall flow out of the annular space in the box against the journal or bearing, and thereby keep off all dust, sand, &c., which might otherwise lodge on or in it.

*Feeding Fine Fuel to Furnaces, Forges, &c.*, has been patented by Mr. Augustus Greiner, of Somerset, Ohio. It consists of an air-tight coal dust vessel provided at one end with an inlet adapted to be connected with an air or steam supply, and at the other end with an outlet adapted to be connected directly with the furnace.

*Duplicating Press.*—Mr. Henry S. Norse, of 2238 Third-avenue, New York city, has patented an improved duplicating press. The object of this invention is to furnish a foot or power press for use in printing from stencil plates, particularly stencils prepared with the Edison electric pen, so that the labour and time heretofore required in such work shall be reduced. The invention consists in a hinged frame carrying the stencil plate, and a vibrating lever carrying the ink roller, combined together and with a fixed platen or bed, and operated by mechanism of novel construction, by which the hinged frame is raised for insertion of the paper, dropped upon the paper, the ink roller brought over the stencil plate with the required pressure, and then withdrawn while the frame is again raised.

*Hoop Making Machine.*—This machine, patented by Mr. Edward E. Thresher, of Reed City, Mich., is designed especially for cutting hoops from boards or planks, and is so constructed as to cut the timber into oval strips and cut each strip into two bevelled hoops. The machine can be readily adjusted for sawing lath and making mouldings.

*An Improved Crate* for the transportation of fish, meats, and other like perishable articles, so as to protect them from decomposition during transportation or storage, has been patented by Mr. William S. Braman, of Key West, Fla. It consists of a crate made of a network of galvanised iron, and provided with a series of knees or projections, which keep the sides of the crate from coming in contact with the sides of the box.

*Hydrant Valves.*—Mr. John Flanagan, of Newbury, N. Y., has patented an improvement in hydrant valves. The invention consists in combining with a hydrant case having a side aperture and an apertured extension a cross slotted cylinder provided with annular exterior packing grooves and a valve sustained at the centre by arms and carrying at the lower end a packing disk.

*Inhaler.*—Mr. Albert Rousseaux, of Brussels, Belgium, has patented an inhaler by means of which air impregnated with tar or other medical odours can be inhaled for penetration to the bronchial tubes and lungs. The invention consists in a cigar holder or mouth piece fitted with a cigar-shaped portion containing tar or other materials formed with air conduits, and provided with a cover perforated for admission of air, so that by being held in the mouth the user can inhale the exterior air, which, on passing through the cigar and holder, becomes impregnated with the tar, medicine, or other material used.

*An Engraving Machine* has been patented by Mr. Allan E. Francis, of Garettsville, Ohio. The improvement relates generally to engraving machines employing a pantograph to which are connected the tracer and the engraving tool, and particularly to the means for facing the tool properly and the lever for operating the tool to the construction of the pantograph ; to the construction of the tracer arm and the means for adjusting the tracer ; to the bed and supports of the machine, and the means for adjusting the pantograph and the work. This invention cannot be described without engravings.

*Wagon Gear Improvements* have been patented by Mr. Horace L. Kingsley, of Racine, Wis. The object of this invention is to provide a cheaper and more durable oscillating gear for platform spring wagons, whereby greater elasticity and freedom of movement is given to the wagon bed. The invention consists of the combination, with the bed piece, of horizontal rocking bars having their inner ends supported in a revolving king bolt plate, and their outer ends in segments that travel over the fifth wheel on the platform.

*Spooling Machines.*—Mr. Charles G. Trafton, of Slatersville, R. I., has patented an improved thread guide for spooling machines for guiding the thread as it runs from the bobbin to the larger spool. The object of this invention is to relieve the self-adjusting guide of all pressure tending to increase the friction of its movement, so that the action shall be most delicate. It consists in a guide plate pivoted to a supporting rod that is formed with the friction surface over which the yarn runs.

*Vulcanised Rubber.*—Mr. David Gaussen, of Broughton Hall, Lechlade, County of Gloucester, England, has patented an improvement in the manufacture of vulcanised india-rubber, &c., which consists in corrugating such sheets on both sides, so as to produce a series of hollow arches or hollow semi-cylindrical formations, such as those usually formed by the corrugation of sheets of galvanised iron, the grooves on the one side being alternate with those on the opposite side of the same sheet, that which is a convexity on one side being itself a concavity on the other side, and on one and the same side a convexity or ridge being followed by a concavity, and a concavity by a convexity.

In *canning fruit*, &c., much difficulty and inconvenience are often experienced in introducing the cans or jars into the vessel of water and withdrawing them, and great care must be exercised to prevent the contact of the jars, if they be of glass, with the bottom of the vessel or boiler, lest the jar be broken. A simple, inexpensive, and convenient device for overcoming these difficulties has been papented by Sarah W. Brown, of Hudson, N. Y.

*Converting hides.*—Dr. Christian Heinzerling, of Biedenkopf, Germany, has patented an improved method of converting hides into leather, consisting in subjecting them to the action of a compound containing chromic acid and then treating the hides by a solution of stearine or similar fats.

*An adjustable spring bed bottom* has been patented by Mr. Henry A. Scott, of Athol, Mass. The object of this invention is to furnish invalid bed bottoms having head and foot sections capable of easy adjustment in horizontal or inclined positions, which may be used with and easily removed from ordinary bedsteads.

*Fountain for soda and mineral waters* has been patented by Mr. Charles Jackson, of New Bedford, Mass. The objects of this invention are to permit connection of the two parts of the fountain by a brazed joint, whereby strength and security against leakage are obtained ; to permit inspection of the interior of the fountain ; to permit of their being readily washed out and re-tinned without separating the joints.

In the manufacture of *scrap book and other books* of a similar character it is necessary to provide guards or spacings between the sections of the book, and this is usually done by inserting the sections between folded strips of paper, and the sections and strips being forward secured together, the strips form the guard between the sections. Mr. Frank Bowman, of Brooklyn, N. Y., has patented a device which obviates these difficulties of manufacture, and reduces the expense, and produces a stronger and better appearing scrap-book.

*Traps.*—A cheap, simple, and effective trap, to be placed over mole or gopher "runs" for the purpose of destroying the animals, has been patented by Henry W. Hales, of Ridgewood, N. J.

*Chalk holder.*—An improved chalk holder for billiard tables has been patented by Mr. John Jefferson, of Columbus, O. The invention consists of cords, weights, and pulleys attached to and moving in suitable casing and tubes attached to the gas fixture, chandelier, or other object over the billiard table, the chalk being suspended above the table by the cord. It may be drawn down to a convenient position for use, and when released will be automatically returned to place.

*Cryptography*—An improvement in cryptography has been patented by Mr. Charles G. Burke, of New York city. The invention consists in the use of four characters, differing in form of colour, which, when used in combination with a scale consisting of three horizontal parallel equidistant lines and spaces, represent intelligible sounds, which are convertible into words and sentences, and may be substituted for and made the equivalent of the English language.

Messrs. Green E. Hood and Charles W. Tift, of Albany, Ga., have patented a *cotton-seed planter and guano distributer* so constructed that it can be readily adjusted to plant more or less seed, or distribute more or less seed, or distribute more or less guano, and to cover the seed to a greater or less depth, as may be required.

*Wool Carding Machines.*—An improvement in wool carding machines has been patented by Messrs. William E. Bosworth and H. Wallace Bosworth, of Lexington, Ky. The object of this invention is to obviate the trouble experienced in carding machines from the wool getting under the creel spools and thereby becoming tangled, stretched, and broken ; also, to prevent accumulation of wool on the guides of the carding machine where the rolls enter, so that free passage of the rolls shall not be hindered.

*Wheel Nave.*—Mr. John Nagele, of Clarendon, Ark, has patented an improved vehicle wheel hub or nave designed especially for buggies and light wagons, and also adapted to heavy vehicles. The invention consists of a hub provided with open-sided spoke mortises for staggering spokes, of annular caps or flanges fitted over the ends of the hub against the outer faces of the spoke tenons, and of a projecting band or collar, in combination therewith, that encircles the hub between the two sets of spokes and supports them on their inner faces.